
NORTH PACIFIC MARINE SCIENCE FOUNDATION

NOAA Performance Report (NA96FX0124)

Grant Number: NA96FX0124
Amount of Grant: Federal: \$1,821,250
Project Title: Research Into the Causes of the Steller Sea Lion Decline in the North Pacific
Grantee: North Pacific Marine Science Foundation
Award Period: July 01, 1999 - June 30, 2002
Report Period: July to December 2001

SUMMARY OF PROGRESS AND EXPENDITURES

The North Pacific Universities Marine Mammal Research Consortium continues to do research into what has caused the decline of Steller sea lions. Studies are undertaken in captivity, in the laboratory and in the field.

Captive Studies:

General research continued on a daily basis at the Vancouver Aquarium Marine Science Centre. In November, two beluga whales were relocated to the Research pool curtailing all research being undertaken on the Steller sea lion foraging project.

Bioenergetics

- ☐ measurements of resting metabolic rate were taken approximately every 2 weeks, for a total of 72 trials during this period
- ☐ body mass was taken weekly
- ☐ other morphological measurements (i.e., girth at 4 sites, body length) were taken twice a week
- ☐ blood samples obtained for clinical analysis were drawn approximately every 6 weeks - extra samples have been stored for use in present and future studies
- ☐ body composition was measured approximately every 12 weeks by deuterium dilution, although the 2 juvenile females had more frequent sampling as part of the Atka mackerel experimental protocol

- ☐ plans underway for Dr. Rosen to carry out the experiment in summer 2002, assisted by a summer student

Foraging Behavior of Juvenile Steller Sea Lions

- ☐ collected data on yearlings foraging in research pool in September and October
- ☐ film segments were chosen for analysis
- ☐ began digitizing video segments for analysis
- ☐ Olivier Cheneval (M.Sc.) candidate to take 1 year leave of absence from January 2002

Other

- ☐ animal health was monitored by regular veterinary examinations and analysis of blood parameters
- ☐ general maintenance of the research area was maintained
- ☐ permission to purchase a larger squeeze cage has been requested, a transport cage for moving the larger animals was obtained
- ☐ job postings for a Postdoctoral Fellow and trainer for the Open Water study were posted
- ☐ trials with 3 animals of a study of heat flux conducted by Kate Willis and Markus Horning (Texas A&M) were undertaken
- ☐ David Rosen attended meetings to discuss and revise plans for renovations of the research area at the Vancouver Aquarium (CFI grant), attended the NOAA Steller sea lion co-ordinating meeting in Seattle, submitted corrections to the manuscript "Cost of transport in Steller sea lions, *Eumetopias jubatus*" to Marine Mammal Science (accepted for publication 15 July), submitted manuscript "Changes in metabolism in response to fasting and food restriction in the Steller sea lion (*Eumetopias jubatus*)" to Comparative Biochemistry and Physiology (accepted for publication 12 December) and presented results from the Pollock Diet experiments at the 14th Biennial Conference on the Biology of Marine Mammals
- ☐ Jan McPhee successfully defended her thesis based on heart rate studies and is now working on publications

Population Viability

- Artiss Winship worked on developing a population model for Steller sea lions in Alaska for performing a population viability analysis (PVA).
- ☐ reviewed population modeling literature (including PVA) of Steller sea lions and other species, and Bayesian statistical techniques for population modeling

Construction of the new tanks at the Vancouver Aquarium has been delayed with a tentative new date of March 2002. The Fatty Acid Validation experiment was consequently delayed. Phase two feeding experiments will remain small scale until after construction of larger tank

New Technologies for Remote Monitoring of Wild Steller Sea Lions

Russ Andrews, Postdoctoral Fellow, worked on the following:

An important factor in developing the ability to implant satellite transmitters (PTT) is the modification of current PTT antenna design. Therefore, the following designs were investigated and scale prototypes were constructed to examine feasibility:

- ☐ Percutaneous antenna (antenna guards for tissue stabilization at the percutaneous site were designed for both types.):
 - i. Horizontal whip
 - ii. Horizontal helical
- ☐ Fully implanted antenna:
 - i. Short helical antenna, either horizontal or vertical.
 - ii. Horizontal whip
 - iii. Horizontal dipole
 - iv. Loop, or planar coil

In order to determine when the implanted PTT is above the plane of the sea surface, novel methods of transducing a sea lion's presence at the sea surface using a completely implanted sensor were developed, but prototyping awaits further development of the new PTT control electronics by the manufacturer.

In order to facilitate the development of new methods for estimating the timing and quantity of prey ingestion, work has been done on our existing foraging behavior data, including new analysis, interpretation, and preparation for publication.

Body Growth

- ☐ preliminary contacts have been made with Japanese researchers to access feeding and growth records. The largest numbers of captive Steller sea lions are in Japan
- ☐ a two-week trip is planned to visit Japanese Aquariums holding Steller sea lions to obtain copies of their records and to verify details of data collection. The trip will occur in April or May 2002

Timing of Molt

- ☐ molting of wild animals was observed at Lowrie Island (a stable population) from July 1 through November 24, 2001. Due to a personal emergency, Raychelle

- ☐ demographic data were collected from by-catch sharks on the above noted IPHC cruise that provides one of the first attempts to carry out a size based analysis for an age length key. A section of cartilage was also collected to examine for annual rings. Since only the smallest sharks can be brought on board the vessel, more accurate data is needed for the larger sharks
- ☐ demographic data were collected on the above noted PWS cruise that provides initial data for age determination. Morphometric data were collected on 35 sharks. A section of cartilage was also collected from 10 sharks. In addition, information about life history was also collected. In particular, reproductive data on the presence of eggs was collected and each uterus was examined for evidence of past reproductive activity. In addition, both shell glands were collected and preserved in formalin, looking for stored sperm as evidence of at least one past copulation. Blood samples were collected from 35 sharks for steroidal analysis to estimate age or size of sexual maturity
- ☐ genetic data were collected in the form of skin biopsies for population genetics analysis. About 20 samples were collected and preserved in alcohol
- ☐ genetics data were collected in the form of skin biopsies. About 30 samples were collected and preserved in alcohol
- ☐ initial population parameter estimation has been started. Alternative methods for statistical analysis of catch per unit effort were and are being carried out for sleeper and salmon sharks. Only preliminary demographic quantitative modeling has been started
- ☐ significant information is accumulating about the migratory behavior of the salmon sharks. Already it is known that females will travel thousands of miles to the transition zone. More information continues to arrive from satellite communication

Publication:

- ☐ Gallucci organized a 90 minute symposium at the AAAS Annual Meeting entitled: Too Many Sharks, Too Few Sea Lions and Global Climate Change, in February, 2002. The three presentations are entitled:
 1. Pinniped Abundance Changes: Endangered Sea Lions, Thomas Loughlin
 2. Shark Abundance Changes: An Unexpected Explosion, Vincent Gallucci, Lee Hulbert, Bruce Wright
 3. Sharks, Pinnipeds and Ecosystem Dynamics, Vincent Gallucci and Bruce Wright
- ☐ Gallucci is currently discussing with "Science" editors a publication for the "Perspectives" section. Other publications are in process summarizing much of the above about life history of the shark and how it intersects that of the sea lions.

without any change to the Total Direct Costs, Indirect Costs, or Total Cost of Project line items in the original budget approved by the Consortium and Oregon State University.

NOAA NMFS agreed to the request by which time Dr. Shaffer had accepted a position in Norway. Dr. Roby is now seeking another Research Associate.

Population Trends and Dynamics of Steller Sea Lions in Oregon

Researchers from Oregon State University (OSU) and the Oregon Department of Fish and Wildlife (ODFW) completed the following:

- ☐ all field data collection activities supported under this contract were completed during the original 12-month contract period (July 1, 2000 - June 30, 2001). This work consisted of two aerial photographic surveys for Steller sea lions along the Oregon coast, one conducted during the 2000 reproductive period
- ☐ scat collection trips for food habits analysis were conducted during two trips to the Rogue Reef rookery area on the southern Oregon coast
- ☐ processing of scats and identification of sea lion prey items was completed
- ☐ analysis of statewide Steller sea lion trend counts was also completed
- ☐ a preliminary analysis and summary of the results from this work was presented in the poster session at the 14th Biennial Conference on the Biology of Marine Mammals (Nov-Dec, 2001 - Vancouver, B.C.)
- ☐ beginning in December 2001, ODFW began work on their final contract report, which will be submitted to OSU prior to March 21, 2002
- ☐ OSU researchers continued work on formulating and debugging the bioenergetics model for sea lion growth
- ☐ the completion report for the project will be submitted to the Consortium by March 21, 2000

Administration

- ☐ preproposals for research to be undertaken in year 2002 were requested and obtained
- ☐ the Research Committee met in December to discuss current and future research
- ☐ the audit was successfully completed
- ☐ researchers attended the Biology of Marine Mammal Conference in Vancouver (November 2001). Consortium researchers presented papers and posters (copies of posters mailed under separate cover)
- ☐ attached is a "List of Publications, Dissertations, Presentations, and Reports Supported in Part or in Whole by Consortium Funds" (2001)

STATEMENT AS OF DECEMBER 31, 2001

PROJECT	US \$ BUDGET	Rev. US BUDGET	REVISED US BUDGET	YTD	Outstanding Payments	Budget less YTD & Outstanding	DRAW DOWN
YEAR FOUR							
Captive	122,055		122,055	121,929	1,298	(1,173)	120,155
Bioenergetics	30,030		30,030	30,030	70	(70)	30,030
Rats	17,500	2,002	19,502	19,502	438	(438)	19,502
Scat	10,102		10,102	10,284	-	(182)	10,284
Nutrition	35,000	(2,002)	32,998	25,075	(0)	7,923	24,804
Admin	53,674		53,674	53,673	-	1	53,673
TOTAL BC	268,361	-	268,361	260,493	1,806	6,061	258,448
Alaska	53,689	(16,361)	37,328	37,327		1	37,328
TOTAL	\$ 322,050	(16,361)	\$ 305,688	\$ 297,820	\$ 1,806	\$ 6,062	295,776
YEAR FIVE							
Pups	100,000		100,000	81,443	9,775	8,782	79,449
Bioenergetics	154,276		154,276	127,912	10,270	16,094	124,184
New Technology	46,340		46,340	22,900	3,933	19,507	22,889
Molting	17,450		17,450	14,716	1,176	1,558	17,450
ScatModel	39,595	16,361	55,956	52,773	1,624	1,559	50,379
Whales	12,372		12,372	10,178	-	2,194	11,189
Biases in Scat	17,085		17,085	11,249	175	5,661	10,063
Atka Mackerel	5,500		5,500	367	-	5,133	400
Admin	14,243		14,243	12,810	-	1,433	11,220
TOTAL BC	\$ 406,861	16,361	\$ 423,222	\$ 334,346	\$ 26,953	\$ 61,922	\$ 327,223
UA Sea Lion Harvest	23,000		23,000	15,662		7,338	15,661
UA Long Term Variability	78,028		78,028	63,943		14,085	63,941
UW Sea Lion Harvest	49,937		49,937	17,909		32,028	45,111
UW Status of Sea Lions	50,000		50,000	48,763		1,237	13,045
OSU Population Trends	112,174		112,174	108,208		3,966	78,823
TOTAL UNIVERSITIES	\$ 313,139		\$ 313,139	\$ 254,484	\$ -	\$ 58,655	\$ 216,581
YEAR SIX							
Captive	285,000		285,000	18,768	20,664	245,568	15,250
Blubber	20,000		20,000	7,364	7,364	5,271	
Body Growth	40,000		40,000	-	-	40,000	
Scat	40,000		40,000	870	-	39,130	880
Foraging	17,000		17,000	4,134	182	12,684	2,070
Pollock	18,000		18,000	-	-	18,000	
Population Viability	32,000		32,000	9,489	2,305	20,206	4,940
Biases in Scat	45,000		45,000	7,364	633	37,002	2,685
Molt	30,000		30,000	10,779	1,722	17,499	
Leptin	30,000		30,000	3,217	-	26,783	1,725
Admin	42,512		42,512	409	9,114	32,989	250
TOTAL BC	\$ 599,512	\$ -	\$ 599,512	\$ 62,395	\$ 41,984	\$ 495,133	\$ 27,800
OSU Nutritional Stress	46,873		46,873	-	-	46,873	-
UW Stellers - Sharks	73,181		73,181	13,426	-	59,755	13,426
UA Climate Variability	59,634		59,634	8,051	-	51,583	-
TOTAL UNIVERSITIES	\$ 179,688	\$ -	\$ 179,688	\$ 21,477	\$ -	\$ 158,211	\$ 13,426